Do Male and Female Students Use Networks Differently?

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Social and professional networks affect individuals' labor market outcomes, including career path choice, the propensity to find a job, and job match quality (Ioannides and Datcher Loury, 2004; Jackson, 2008; Loury, 2006). Prior research has documented that gender differences in professional network structure help explain men's and women's disparate career trajectories (Lindenlaub and Prummer, 2014; Zeltzer, 2020). In an effort to expand and equalize the networks available to students in their transition to the labor force, colleges and universities have increasingly adopted online student-alumni networking platforms.[1] It is an open question whether equalizing network access for male and female students equalizes network usage.

Using novel administrative data from an online student-alumni professional networking website, we investigate whether there are gender differences in student network usage. One special feature of this website is that all students and alumni users associated with a given university are able to contact one another, thereby holding fixed the network for male and female students.[2] Our main finding is that male and female students use the website similarly. First, there is no gender difference in students' propensity to send a career-related message to a member of their alumni network. Second, the total number of messages sent to alumni is similar among male and female students. Third, male and female students ask questions about similar topics, ranging from requests for guidance about careers to inquiries regarding internship opportunities. Last, using natural language processing, we document that the tone of the inquiries differs only slightly by student gender.

This paper contributes to the literature on gender differences in networks and networking behavior (Mengel, 2020; Marmaros and Sacerdote, 2002; Lindenlaub and Prummer, 2014). Our paper is closely related to Obukhova and Kleinbaum (Forthcoming), which also conditions on network access in its investigation of alumni networking behavior of MBA students. In contrast to our results, they find that women reach out to alumni for help with their job search substantially more so than men. One benefit of the data used in this paper is that it includes the content of networking attempts. To our knowledge, this is the first paper to investigate gender differences in the content as well as the intensity of networking attempts.

I. Data

This paper draws on administrative data from an online college student-alumni networking platform. The platform is designed to allow current undergraduate students to connect with alumni of their college/university for the purpose of mentorship, career guidance, job search, and professional networking.

The site has more than 50,000 users and provides its services to dozens of universities and colleges, including small liberal arts colleges, large public universities, and elite private universities. Students and alumni sign up for the site and create a profile with information on their academic and professional background and

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[1] See, for example: `https://www.nytimes.com/2018/11/02/education/learning/colleges-universities-career-services.html`

[2] This is not the case with other popular professional networking websites such as LinkedIn, where access to other site users is restricted based on one's existing connections.

career intentions. Site users who are part of the same university/college community can directly message one another on the platform.

The data include all messages transmitted on the site, de-identified and linked to sender and recipient by profile ID. Gender is assigned based on the first name of the user.[3] The mentoring platform data also includes information on site users' profiles, including self-reported degree, year of graduation or intended graduation, and college major. We manually classify college majors according to ACS 2016 general degree codes.[4]

Table 1 provides summary statistics on student site users. The student population is 50 percent female. Students are primarily from research universities. Twelve percent of student users send at least one message on the site. As expected, there are considerable gender differences in student college majors, summarized in Online Appendix Figure 1.

We observe 13,038 conversations on the site, where a conversation is defined as a series of messages between two people. In order to study the networking behavior of undergraduate students with alumni, we restrict our analysis to the 6,325 conversations initiated by students and sent to alumni recipients. We drop schools that had fewer than 100 student-initiated conversations. We also drop the few students who exhibited outlier usage of the site, defined as the 99th percentile most prolific student senders in terms of messages to unique alumni, yielding a sample of 4,250 messages. We further restrict the sample to conversations that pertain to the students' future careers. Dropped conversation topics include inquiries regarding interviews for a class project, invitations to speak to a class, thank you messages from prior interactions, and inquiries regarding housing/re-location. We also drop 51 messages which cannot be classified into the above categories. These final restrictions yield a sample of 3,374 conversations, which we analyze in the remainder of the paper.

Table 1—: Student Summary Statistics

	Male	Female
Demographic Info		
Liberal Arts College	0.30	0.37
	(0.46)	(0.48)
Research University	0.70	0.63
	(0.46)	(0.48)
Grad. Year	2019	2019
	(2.81)	(2.62)
Grad. Year Not Listed	0.51	0.51
	(0.50)	(0.50)
Major Not Listed	0.53	0.53
	(0.50)	(0.50)
Site Activity		
Any Message Sent	0.11	0.12
	(0.31)	(0.33)
Total Messages Sent	0.38	0.35
	(1.82)	(1.58)
Observations	4626	4631

Note: This table present summary statistics for all student site users in our analysis sample. Means are reported, with standard deviations in parentheses.

The detailed information on messages sent allows us to analyze gender differences in network usage, including the number of messages sent as well as the length of the messages. Using the de-identified content of the messages exchanged, we also study

[3]We first assign gender using the 1990 Census and 1940-1970 Social Security Administration (SSA) name files. For a given name, if 90 percent of individuals with this name are classified as either male or female, then the name is designated as such. The remaining names are left as unclassified. In cases where there is conflict between the Census and SSA assigned gender, a name is unclassified. Because our sample includes names uncommon in the US, we use the API genderize.io, accessible at: `https://genderize.io`, to classify any names which are uncommon or unknown in the Census and SSA files, using the same 90% criteria for assigning names.

[4]There are 39 codes, available at: `https://usa.ipums.org/usa-action/variables/DEGFIELD#codes_section`

whether female and male students seek information on different topics or use a different tone.

II. Results

We first analyze whether there are gender differences in general site usage: sending any message to an alumnus and the number of messages sent. We use the following student-level specification:

$$(1) \qquad Y_i = \alpha + \beta Female_i + X_i'\gamma + \epsilon_i$$

where Y_i is either an indicator for whether the student sent any career-related message, or the total number of messages sent, $Female_i$ indicates whether the student is female, and X is a vector of controls for student major, graduation year, and school. Table 2 Panel A presents the results, with and without controlling for student characteristics. Female students are ten percent (or 1.3 percentage points) more likely than men to send any message at all, but this difference is halved to an insignificant 0.6 percentage point difference when including major, school, and graduation year controls. The total number of messages sent does not differ significantly between male and female users, though point estimates suggest that female students send about ten percent fewer messages than male students in total. Overall, we conclude that male and female students use the site similarly to contact alumni about careers. These results stand in contrast to previous research that has documented a gender ask gap on various dimensions, including the propensity to negotiate salaries and to seek advice in lab experiments (Babcock and Laschever, 2003; Biasi and Sarsons, 2020; Heikensten and Isaksson, 2018).

Even if male and female students send a similar number of messages on the site, the messages they send may differ in length, content, and sentiment. Next we turn to analyzing these message attributes using the following message-level specification:

$$(2) \qquad Y_{im} = \alpha + \beta Female_i + X_i'\gamma + \epsilon_{im}$$

where Y_{im} represents various message outcomes, and the rest of the variables are as above. Table 2 Panel B analyzes gender differences in the length of messages sent. We find no statistically significant gender differences in message length, as measured by the number of characters in the message. Table 2 Panel B column 1 shows that female students send messages that are 14 characters longer than male students, but this is a small percentage difference, given that messages are on average 518 characters. This result does not change when we control for student major, school, and graduation year in column 2.

To analyze gender differences in the content of messages, we classify whether each message contains the following non-mutually exclusive topics: asking about the alumnus' career path, help with job search, asking about the alumnus' experience in his or her job, asking for a job at the firm of the alumnus, either directly or indirectly, asking for an internship, either directly or indirectly, asking to shadow the alumnus at his or her job, help with college major choice, and help with course selection. We also record whether a message asks for an in-person meeting or a phone call. Figure 1 plots the coefficient on $Female_i$ from Equation (2), where Y_{im} indicates whether a message contains a particular topic. We run twelve different regressions, one for each topic described above. For each topic, the location of the marker represents the coefficient on $Female_i$. The number above the marker states the total fraction of messages discussing the topic. The width of the bar represents the 95 percent confidence interval. Most messages ask alumni for information about their career path (64 percent of messages), job search help/advice (24 percent of messages), or internships—21 percent of messages sent by students directly ask alumni whether they have an internship opportunity for the student and an additional 9 percent ask indirectly. There are no statistically significant differences by gender along for any message topic.

Does message tone differ by student gender? To answer this, we use the

Table 2—: Gender Differences in Network Usage

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A. Number of Messages Sent					
	Any Message		Total Messages			
Female	0.013*	0.006	-0.027	-0.040		
	(0.007)	(0.007)	(0.035)	(0.035)		
Mean	0.116		0.364			
N	9257	9257	9257	9257		
	Panel B. Message Attributes					
	Number of Characters		Fraction Positive Words		Fraction Negative Words	
Female	13.866	5.760	-0.000	-0.001	0.001	0.001*
	(31.392)	(32.147)	(0.002)	(0.002)	(0.001)	(0.001)
Mean	517.532		0.041		0.003	
N	3374	3374	3374	3374	3374	3374
Controls	N	Y	N	Y	N	Y

Note: Panel A reports the coefficient on $Female_{im}$ from estimation of Equation (1). Panel B reports the coefficient on $Female_{im}$ from estimation of Equation (2). Controls include school fixed effects, student major fixed effects, and graduation year fixed effects. Robust standard errors in parentheses, clustered at the student sender level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Bing and NRC sentiment lexicons, which categorize words as belonging or not belonging to various sentiments.[5] Examples of positive words are "love" and "hope," negative words are "sorry" and "issues," while examples of words associated with anticipation are "time" and "opportunity." As expected, messages are generally positive, and this is by far the most common sentiment as measured by the fraction of words in the message tagged with that sentiment.

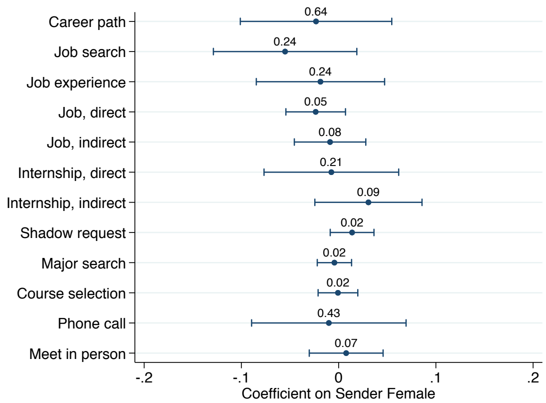
Table 2 Panel B columns 3-6 report the results of Equation (2), where the dependent variables are the fraction of words in a message associated with a positive sentiment and a negative sentiment according to the Bing lexicon. There are few gender differences in the tone of messages. Positive words are far more frequent than negative words, and female and male students use positive words at similar rates. Female students are slightly more likely to use negative words in the specification with controls.

Using the NRC sentiment lexicon, we probe whether there are gender differences in more granular sentiments. There are not substantial gender differences in the proportion of words in a message that are associated with various sentiments, on average, though point estimates suggest that female students tend to send messages with more sentiment (see Online Appendix

[5]Bing only categorizes words into positive and negative sentiments. While NRC uses categories of positive, negative, anger, anticipation, disgust, fear, joy, sadness, surprise, and trust (Mohammad, 2016).

Figure 2).

Figure 1. : Gender Differences in Content of Student Messages to Alumni



Note: This figure plots the coefficient on $Female_{im}$ and its 95 percent confidence intervals from estimation of Equation (2). The mean of each dependent variable is listed above the plotted point estimate. Controls include student school, major, and graduation year.

III. Conclusion

Using new administrative data from a student-alumni networking platform, we investigate gender differences in student site usage. We document that male and female students use the site similarly: they ask alumni questions at similar rates, about similar topics, using messages of similar length and sentiment. This evidence highlights the potential of equalizing men's and women's access to networks in reducing gender disparities in early career outcomes.

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